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INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

272nd Engineering Installation Squadron

La Porte Air National Guard Station
Texas Air National Guard
La Porte, Texas

December 1990

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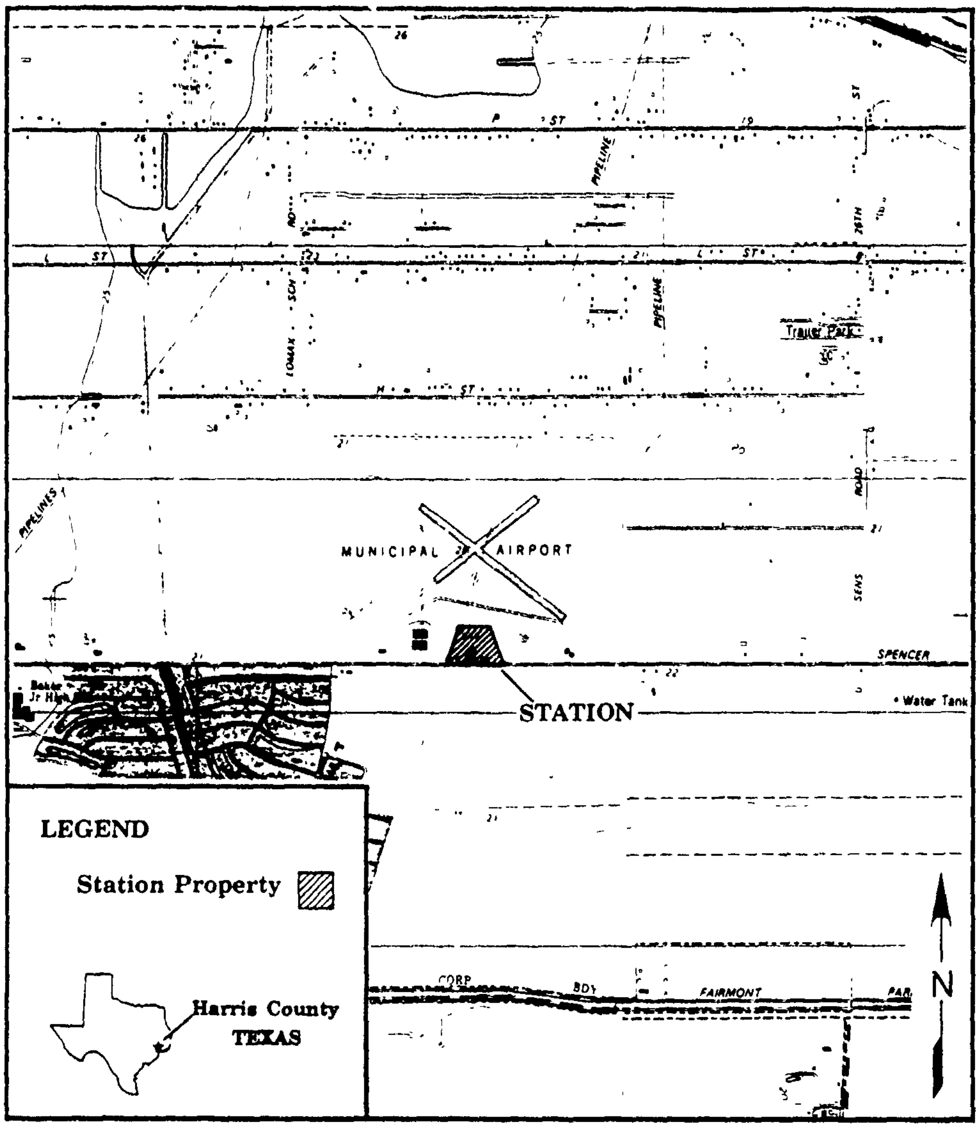

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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT

272nd ENGINEERING INSTALLATION SQUADRON
LA PORTE AIR NATIONAL GUARD STATION
TEXAS AIR NATIONAL GUARD
LA PORTE, TEXAS

Prepared for

National Guard Bureau
Andrews Air Force Base, Maryland 20331-6008

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ACRONYM LIST

AGE	Aerospace Ground Equipment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EIS	Engineering Installation Squadron
EO	Executive Order
EPA	Environmental Protection Agency
FR	Federal Register
FS	Feasibility Study
HARM	Hazard Assessment Rating Methodology
HAS	Hazard Assessment Score
HAZWRAP	Hazardous Waste Remedial Actions Program
IRP	Installation Restoration Program
MOGAS	Automotive Gasoline
NGB	National Guard Bureau
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PL	Public Law
POC	Point of Contact
RCRA	Resource Conservation and Recovery Act of 1976
R&D	Research and Development
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SciTek	Science & Technology, Inc.
SI	Site Investigation
USAF	United States Air Force
USC	United States Code
UTA	Unit Training Assembly

EXECUTIVE SUMMARY

A. INTRODUCTION

Science & Technology, Inc. (SciTek) was retained to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the 272nd Engineering Installation Squadron (EIS), La Porte Air National Guard Station [hereinafter referred to as the Station] located at La Porte, Texas. For the purpose of this document, the Station shall include the total area leased by the 272nd EIS at La Porte, Texas.

The PA included the following activities:

- an on-site visit, including interviews with a total of five persons familiar with Station operations, and field surveys by SciTek representatives during June 18-22, 1990;

- acquisition and analysis of information on past hazardous materials use, waste generation, and waste disposal at the Station;

- acquisition and analysis of available geological, hydrological, meteorological, and environmental data from federal, state, and local agencies; and

- the identification and assessment of sites on the Station that may have been contaminated with hazardous wastes.

B. MAJOR FINDINGS

The 272nd EIS has used hazardous materials and generated small amounts of wastes in mission-oriented operations and maintenance at the Station since 1951.

Operations that have involved the use of hazardous materials and the disposal of hazardous wastes include vehicle maintenance and maintenance of aerospace ground equipment (AGE). The hazardous wastes disposed of through these operations include varying quantities of fuels, acids, paints, thinners, strippers, solvents, and oils.

The field surveys and interviews resulted in two sites being identified that exhibit the potential for contaminant presence and migration.

C. CONCLUSIONS

It has been concluded there are two sites where a potential for contaminant presence exists. These sites are as follows:

Site No. 1 - Abandoned Septic System (HAS - 65)

Site No. 2 - Underground Storage Tank at Building 3 (HAS - 63)

D. RECOMMENDATIONS

Further work under the IRP is recommended for the identified sites to determine the presence or absence of contamination.

I. INTRODUCTION

A. Background

The 272nd Engineering Installation Squadron (EIS), La Porte Air National Guard Station [hereinafter referred to as the Station] is located at La Porte, Texas. The 272nd EIS has been active at its present location since 1951. Both the past and current operations have involved the use of potentially hazardous materials and the disposal of wastes. Because of the use of these materials and the disposal of resultant wastes, the National Guard Bureau (NGB) has implemented the Installation Restoration Program (IRP).

The IRP is a comprehensive program designed to:

- o Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on Department of Defense (DoD) installations and

- o Control hazards to human health, welfare, and the environment that may have resulted from these past practices.

During June 1980, DoD issued a Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act of 1976 (RCRA) and in anticipation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, Public Law (PL) 96-510), commonly known as "Superfund." In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via an Executive Order (EO 12316). As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5 (December 11, 1981), which reissued and amplified all previous directives and memoranda.

Although the DoD IRP and the Environmental Protection Agency (EPA) Superfund programs were essentially the same, differences in the definition of program activities and lines of authority resulted in some confusion between DoD and state/federal regulatory agencies. These difficulties were rectified via passage of the Superfund Amendments and Reauthorization Act (SARA, PL-99-499) of 1986. On January 23, 1987, Presidential Executive Order EO 12580 was issued. EO 12580 effectively revoked EO 12316 and implemented the changes promulgated by SARA.

The most important changes effected by SARA included the following:

- Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan [40CFR300], listing on the National Priorities List, and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the EPA under Superfund authority.

- Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration Program (DERP). This was accomplished by adding Chapter 160, Sections 2701-2707 to Title 10 United States Code (10 USC 160).

- SARA also stipulated that terminology used to describe or otherwise identify actions carried out under the IRP shall be substantially the same as the terminology of the regulations and guidelines issued by the EPA under their Superfund authority.

As a result of SARA, the operational activities of the IRP are currently defined and described as follows:

- **Preliminary Assessment**

  The Preliminary Assessment (PA) process consists of personnel interviews and a records search designed to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, public welfare, or the environment. Previously undocumented information is obtained through the interviews. The records search focuses on obtaining useful information from aerial photographs; Station plans; facility inventory documents; lists of hazardous materials used at the Station; Station subcontractor reports; Station correspondence; Material Safety Data Sheets; federal/state agency scientific reports and statistics; federal administrative documents; federal/state records on endangered species, threatened species, and critical habitats; documents from local government offices; and numerous standard reference sources.

- **Site Inspection/Remedial Investigation/Feasibility Study**

  The Site Inspection consists of field activities designed to confirm the presence or absence of contamination at the potential sites identified in the PA. An expanded Site Inspection has been designed by the Air

National Guard as a Site Investigation. The Site Investigation (SI) will include additional field tests and the installation of monitoring wells to provide data from which site-specific decisions regarding remediation actions can be made. The activities undertaken during the SI fall into three distinct categories: screening activities, confirmation and delineation activities, and optional activities. Screening activities are conducted to gather preliminary data on each site. Confirmation and delineation activities include specific media sampling and laboratory analysis to confirm either the presence or the absence of contamination, levels of contamination, and the potential for contaminant migration. Optional activities will be used if additional data is needed to reach a decision point for a site. The general approach for the design of the SI activities is to sequence the field activities so that data are acquired and used as the field investigation progresses. This is done in order to determine the absence or presence of contamination in a relatively short period of time, optimize data collection and data quality, and to keep costs to a minimum.

The Remedial Investigation (RI) consists of field activities designed to quantify and identify the potential contaminant, the extent of the contaminant plume, and the pathways of contaminant migration.

If applicable, a public health evaluation is performed to analyze the collected data. Field tests, which may necessitate the installation of monitoring wells or the collection and analysis of water, soil, and/or sediment samples, are required. Careful documentation and quality control procedures in accordance with CERCLA/SARA guidelines ensure the validity of data. Hydrogeologic studies are conducted to determine the underlying strata, groundwater flow rates, and direction of contaminant migration. The findings from these studies result in the selection of one or more of the following options:

1. **No Further Action** - Investigations do not indicate harmful levels of contamination that pose a significant threat to human health or the environment. The site does not warrant further IRP action, and a Decision Document will be prepared to close out the site.

2. **Long-Term Monitoring** - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect the possibility of future problems.

3. **Feasibility Study** - Investigation confirms the presence of contamination that may pose a threat to human health and/or the environment, and some sort of remedial action is indicated. The Feasibility Study (FS) is therefore designed and developed to

identify and select the most appropriate remedial action. The FS may include individual sites, groups of sites, or all sites on an installation. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action with concurrence by state and/or federal regulatory agencies.

- **Remedial Design/Remedial Action**

  The Remedial Design involves formulation and approval of the engineering designs required to implement the selected remedial action. The Remedial Action is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and in situ biodegradation of contaminated soils are examples of remedial measures that might be selected. In some cases, after the remedial actions have been completed, a long-term monitoring system may be installed as a precautionary measure to detect any contaminant migration or to document the efficiency of remediation.

- **Research and Development**

  Research and Development (R&D) activities are not always applicable for an IRP site but may be necessary if there is a requirement for additional research and development of control measures. R&D tasks may be initiated for sites that cannot be characterized or controlled through the application of currently available, proven technology. It can also, in some instances, be used for sites deemed suitable for evaluating new technologies.

- **Immediate Action Alternatives**

  At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate action, such as limiting access to the site, capping or removing contaminated soils, and/or providing an alternate water supply may suffice as effective control measures. Sites requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or long-term monitoring. Removal measures or other appropriate remedial actions may be implemented during any phase of an IRP project.

B. Purpose

The purpose of this IRP PA is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites on Station property.

The potential for migration of hazardous contaminants was evaluated by visiting the Station, reviewing existing environmental data, analyzing Station records concerning the use of hazardous materials and the generation of hazardous wastes, and conducting interviews with current Station personnel who had knowledge of past waste disposal techniques and handling methods. Pertinent information collected and analyzed as part of the PA included a records search of the history of the Station; the local geological, hydrological, and meteorological conditions that might influence migration of contaminants; and ecological settings that indicate environmentally sensitive conditions.

C. Scope

The scope was limited to the identification of sites at or under primary control of the Station and evaluation of potential receptors. The PA included:

- o an on-site visit and field surveys during the period June 18-22, 1990;
- o acquisition of records and information on hazardous materials use and waste handling practices;
- o acquisition of available geological, hydrological, meteorological, land use and zoning, critical habitat, and related data from federal and state agencies;
- o a review and analysis of all information obtained; and
- o preparation of a summary report to include recommendations for further action.

The subcontractor effort was conducted by the following Science & Technology, Inc. (SciTek) personnel: Mr. Ray S. Clark, Civil/Environmental Engineer; and Mr. P. J. McMullen, Geologist/Hydrogeologist. Ms. Carol Ann Beda of the NGB is Project Officer for this Station and participated in the overall assessment during the Station visit. Mr. Larry Janssen of the Hazardous Waste Remedial Actions Program (HAZWRAP) also participated in the Station visit.

The point of contact (POC) at the Station was MSGT Bobby L. Bessent. In addition, MAJ Sheila F. Hooten represented the Host Base, Ellington Field, Houston, Texas.

D. Methodology

The PA began with a visit to the Station to identify all operations that may have used hazardous materials or may have generated hazardous wastes. Figure I.1 is a flow chart of the PA methodology.

A total of five current and past Station employees familiar with the various operating procedures was interviewed. These interviews were conducted to determine those areas where waste materials (hazardous or nonhazardous) were used, spilled, stored, disposed of, or released into the environment. The interviewees' knowledge and experience with Station operations averaged 12 years and ranged from six to 21 years. Records contained in the Station files were collected and reviewed to supplement the information obtained from the interviews.

Detailed geological, hydrological, meteorological, and environmental data for the area were obtained from the appropriate federal and state agencies. A listing of federal and state agency contacts is included as Appendix A.

After a detailed analysis of all the information obtained, two potential sites were identified to be potentially contaminated with hazardous wastes. Under the IRP program, when sufficient information is available, sites are numerically scored and assigned a Hazard Assessment Score (HAS) using the Air Force Hazard Assessment Rating Methodology (HARM). However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather, may indicate a lack of data. A description of HARM is presented in Appendix B.

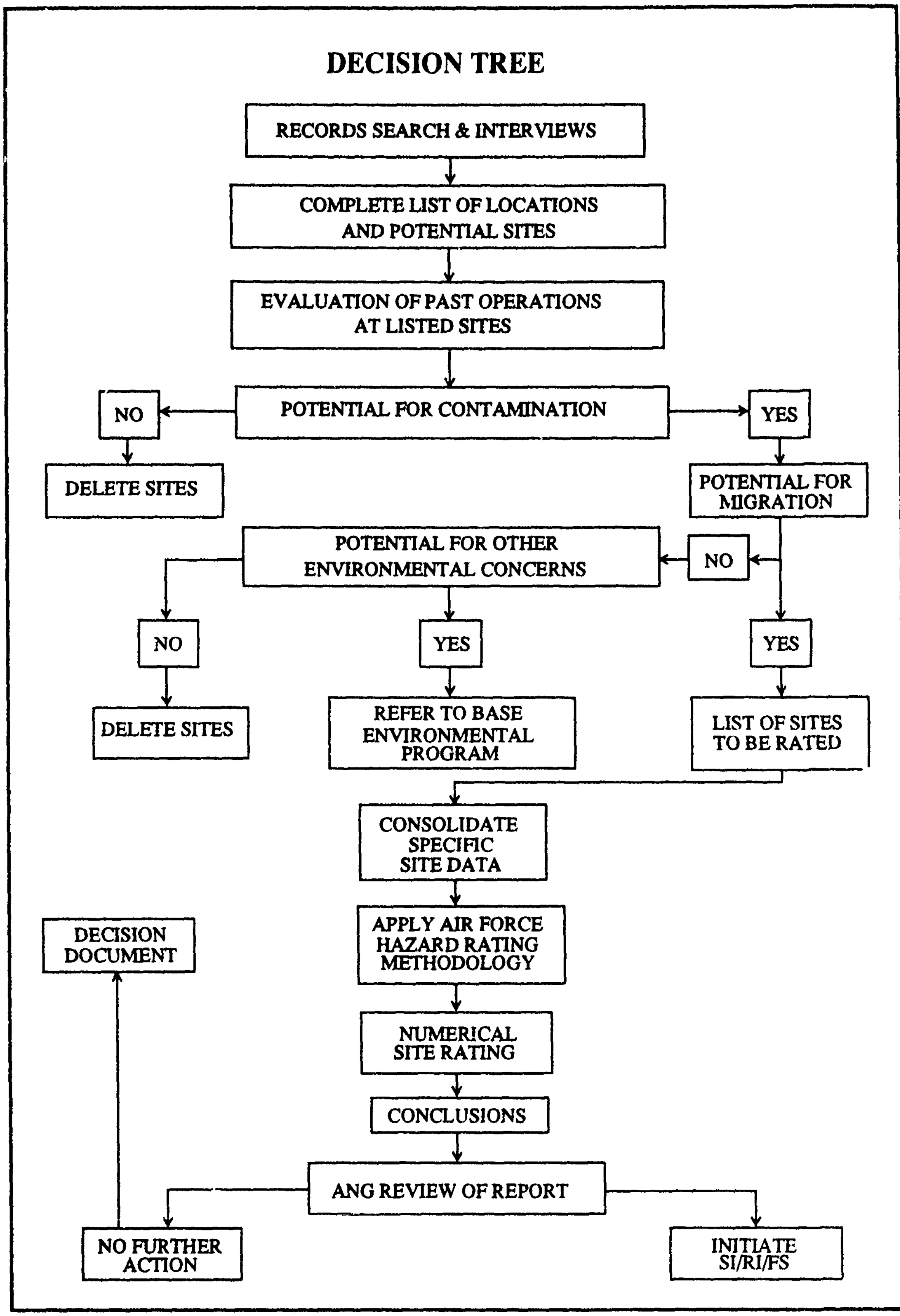


Figure I.1

Preliminary Assessment Methodology Flow Chart

II. INSTALLATION DESCRIPTION

A. Location

The Station is located approximately 2 miles west of Galveston Bay and is adjacent to La Porte Municipal Airport within La Porte, Texas. The major route to the Station is La Porte Freeway (Hwy 225).

The Station occupies approximately 12 acres along Spencer Highway. Figure II.1 illustrates the location and boundaries of the Station. On weekdays, the population at the Station is approximately 19. Unit Training Assembly (UTA) occurs one weekend per month. The Station population during this weekend is approximately 173. The Station is completely fenced with controlled access. The unimproved acreage is used to conduct training and for parking of equipment.

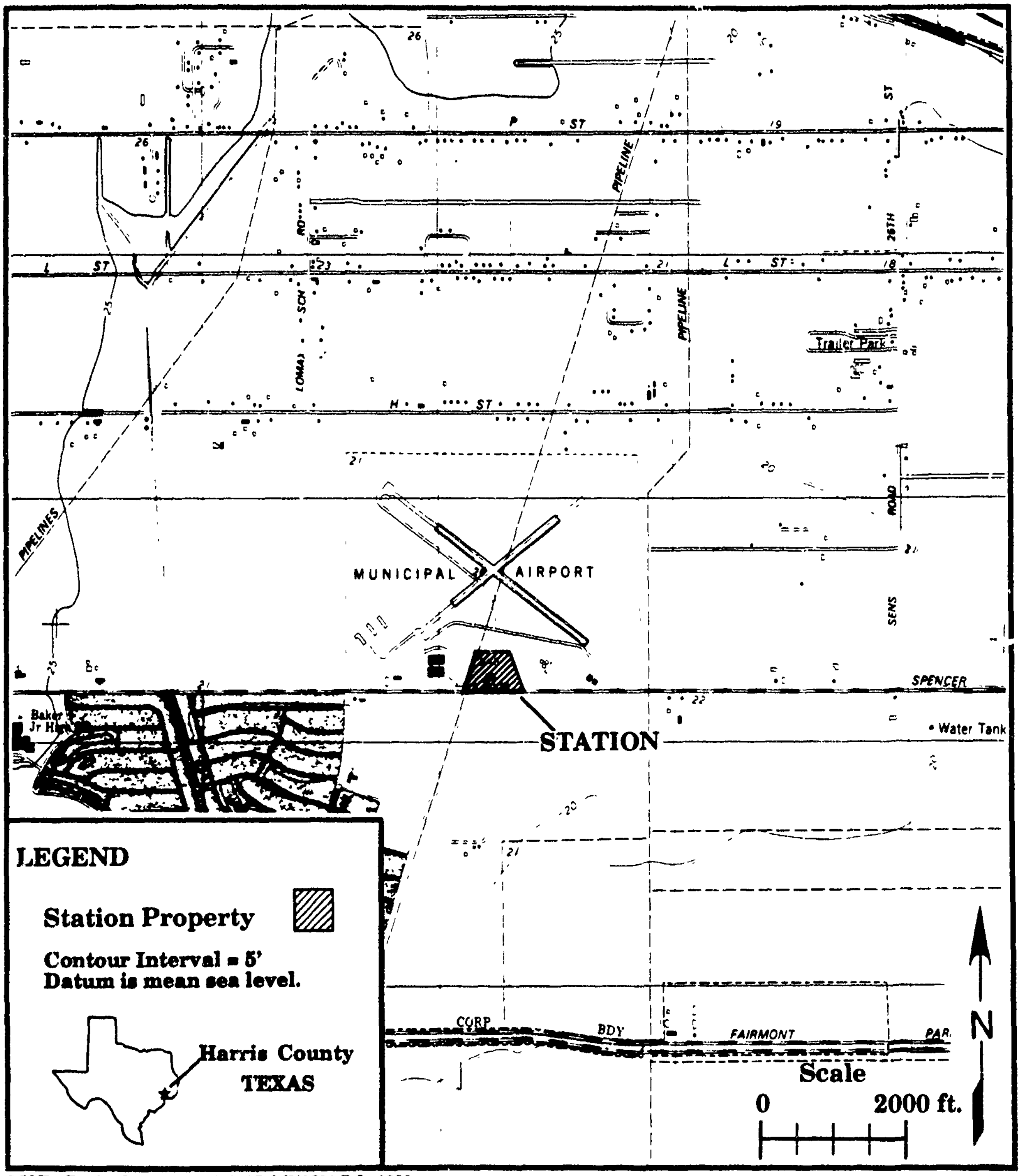
B. Organization and History

The squadron was originally constituted in 1942 and was activated at Pinedale, California, as the 321st Signal Light Company. On July 1, 1948, it was redesignated as the 108th Communications Squadron and assigned to Ellington Air Force Base, Texas. On November 1, 1951, the squadron was relocated to its present position in La Porte, Texas.

The unit combined with the 608th Light Construction Squadron to form the 272nd Communications Squadron. On October 1, 1960, the unit was reorganized and redesignated as the 272nd Ground Electronics Engineering Installation Agency Squadron. The unit was redesignated once again on May 1, 1970, as the 272nd Electronics Installation Squadron. On June 1, 1981, it was redesignated as the 272nd Engineering Installation Squadron.

Today, the mission of the 272nd is essentially the same as in 1942. The mission is to train all personnel to the degree that they will be capable of supporting Air Force Communications Command wartime requirements, for engineering, installation, removal, and relocation of communication-computer systems facilities. The 272nd performs serviceability certification, emergency and/or programmed on-site repair and modification of communication-computer systems equipment.

The unit's mission necessitates the use of potentially hazardous materials that require disposal. These hazardous materials include waste oils, fuels, solvents, paints, and thinners. Such materials are largely generated in vehicle maintenance. AGE maintenance occurs within the vehicle maintenance shop



SOURCE: La Porte Quad N2937.5-W9500/7.5, 1982.

Figure II.1

Location Map of
the La Porte Air National Guard Station

when needed. Washrack activity and the routine maintenance of vehicles, generators, and other equipment results in varying quantities of hazardous materials.

In the past, the majority of hazardous materials have been collected, stored, and then disposed of by a contractor. Various contractors would periodically visit the Station to pick up and dispose of waste oils, fuels, and other wastes. Presently, wastes are collected and stored until disposed of by a licensed contractor.

An abandoned septic system is located southeast of Headquarters (Building 1). The bathroom facilities and a sink in the Vehicle Maintenance Shop and Headquarters drained into the septic tank. The sink was used intermittently for the disposal of battery acid. The acid was often neutralized and/or diluted with water upon disposal. The floor drains in the maintenance shops empty into the storm sewer system.

During the late 1970s, the septic system was abandoned and a sanitary sewer system was connected to the Station. However, the floor drains still empty into the storm sewer.

III. ENVIRONMENTAL SETTING

A. Meteorology

The following climatological data is from Climatography of the United States, No. 81 - Texas (United States Department of Commerce, National Climatic Center, Asheville, N.C., 1982) and Climatic Atlas of the United States (United States Department of Commerce, National Climatic Center, Asheville, N.C., 1979).

Data from Houston Intercontinental Airport (41-4300) and Galveston Weather Station Office (41-3430) demonstrate that the Station has an average annual temperature, for the 29 years from 1951-1980, of 68.9°F. Monthly temperature ranged from a low of 52.5°F in January to 83.1°F in July.

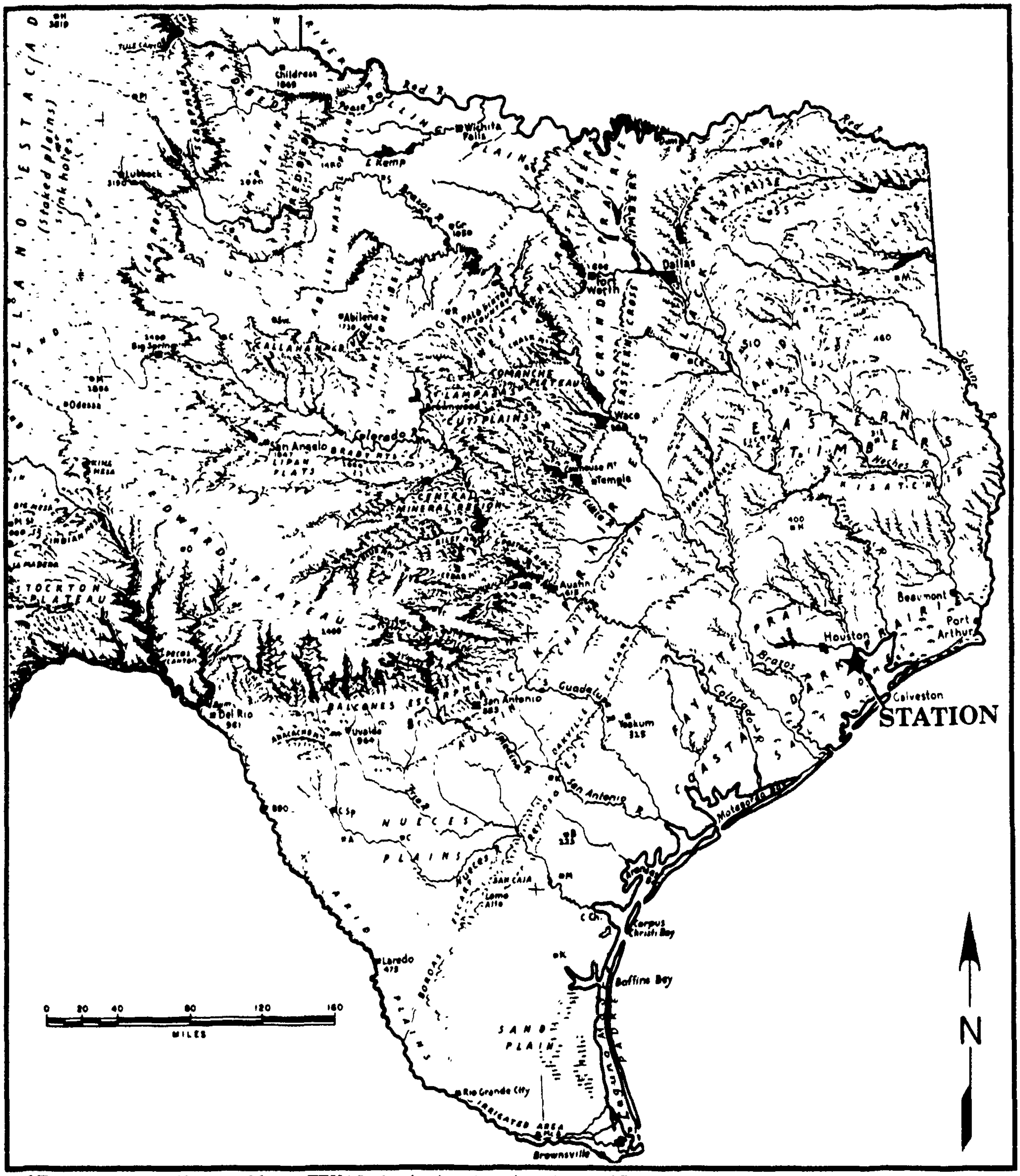
Rainfall is evenly distributed throughout the year, even with thunderstorms, and the average annual precipitation for 1951-1980 was 49.0 inches (41-4315 Houston Deer Park). Mean annual lake evaporation is 53 inches. Net precipitation, which is the difference between mean annual lake evaporation and average annual precipitation, is minus 4 inches per year. Maximum rainfall intensity, based on a 1-year, 24-hour rainfall, is 4 inches.

B. Geology

The Station is located southeast of Houston, Texas on the western side of Galveston Bay in the Coastal Dark Prairie portion of the Texas Gulf Coast Basin (Figure III.1) and has an elevation of 25 feet above mean sea level. Additionally, gentle surface slopes are less than 1 degree per mile towards the Gulf (Figures II.1).

Carsey, 1950, and Waters, 1955, state that at the end of the Cretaceous Period, when the Gulf Coast Basin assumed its present outline, the northwestern portion, including Texas, began to emerge from the seas due to the subsidence in a seaward direction which formed an elongated basin in eastern and southern Texas. This basin was subparallel to the Gulf Coast Basin margins and received in excess of 50,000 feet of clastic sediments throughout the Cenozoic.

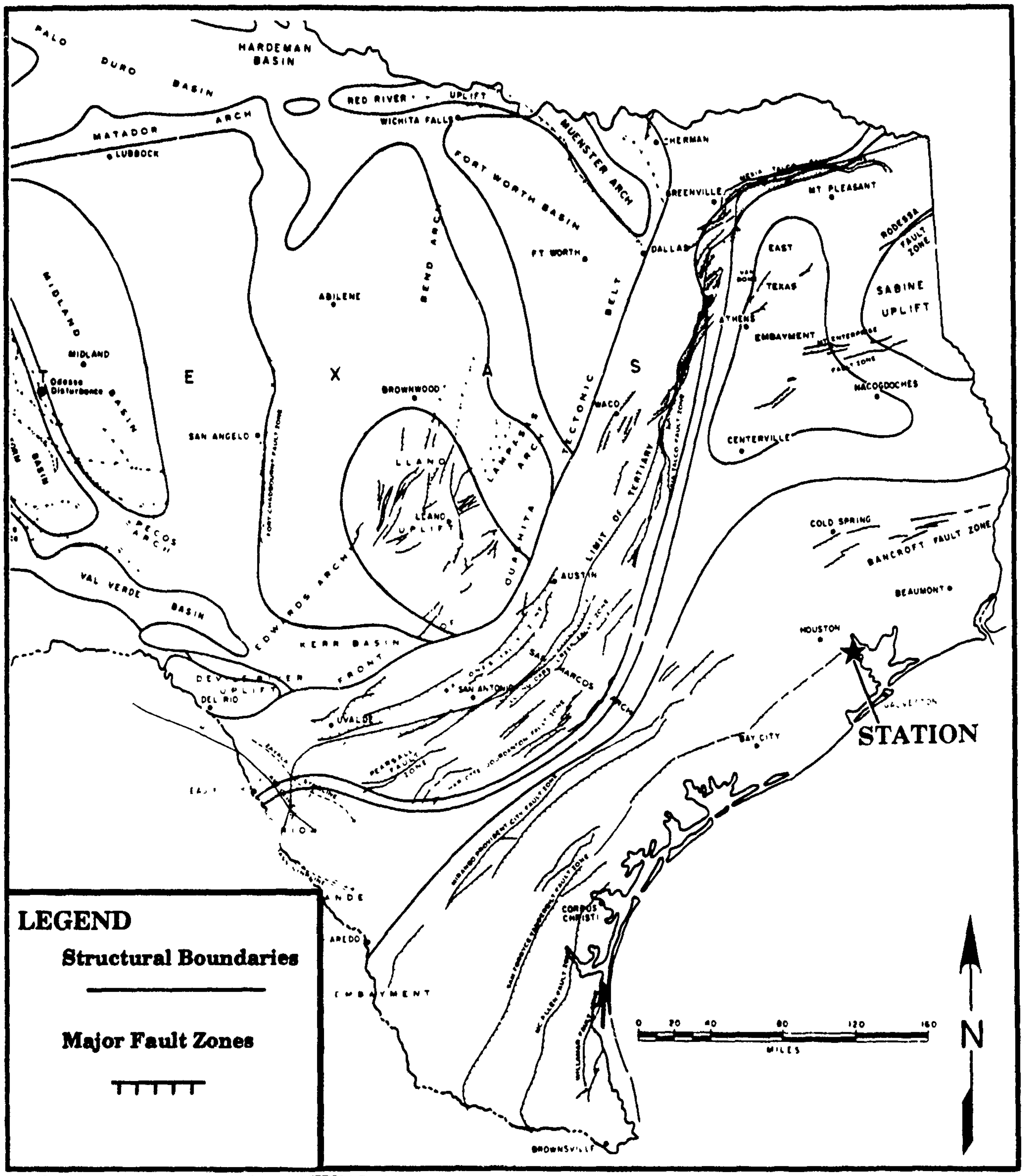
Cenozoic subbasins were formed as a result of differential subsidence associated with stable Paleozoic/Mesozoic positive features like the San Marcos Arch and the Sabine Uplift and Arch. In addition to receiving maximum sedimentation, these subbasins, such as the Texas Gulf Coast basin, were also the focal point for salt-related depositional and structural features (Figure III.2).



SOURCE: Geological Highway Map of TEXAS - by the American Association of Petroleum Geologists.

Figure III.1

Physiographic Map of Texas



SOURCE: Geological Highway Map of TEXAS - by the American Association of Petroleum Geologists.

Figure III.2

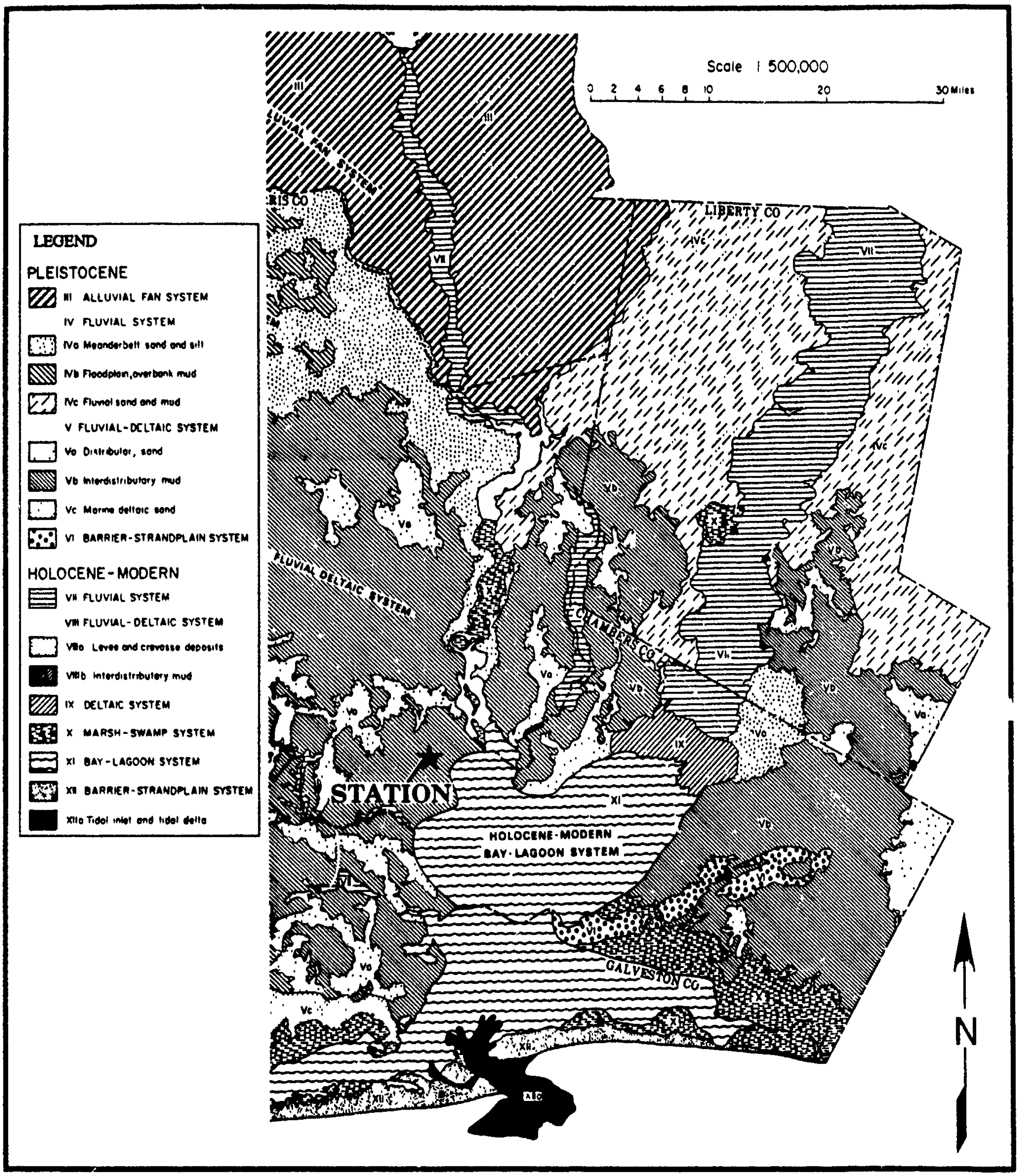
Tectonic Map of Texas

The Cenozoic history of the northwestern Gulf Coast Basin was characterized by a series of subparallel clastic, regressive depositional events interrupted and separated by deposition of alternating transgressive marine shales (Waters, 1955; and Murray, 1961). The transgressive cycles are often accompanied by growth faults. This depositional pattern produced thick wedges of progressively younger sediments in a gulfward direction. Metcalf, 1940, and Solis, 1981, described three distinctive physiographic zones in the Coastal Plain portion of southeast Texas: (1) an inland plain with rolling hills, up to 500 feet above mean sea level, dissected by the Sabine, Neches, Trinity, San Jacinto, and Brazos Rivers; (2) a middle coastal plain with gentler hills and flatter topography - up to 350 feet above mean sea level; and (3) a low coastal plain that is essentially Pleistocene and Recent sediments that form a flat fluvial and deltaic plain composed of flood basin muds cut extensively by meandering rivers and abandoned meanderbelt deposits (Figure III.3). Elevations range from sea level to approximately 100 feet above mean sea level for this low coastal plain.

The Station is located on the low coastal plain and is underlain by sediments assigned to the Quaternary Beaumont Formation (Figure III.4). The sediments assigned to this formation consist of clays, silts, and sands deposited as deltaic, barrier bar, meanderbelt, and flood basin facies. Laterally as well as vertically, this formation interfingers with other Pleistocene sand and shale sequences that make up the Chicot aquifer. In the area of the Station, the Beaumont Formation is mainly clay and mud of slow permeability, poor drainage, and high compressibility.

Like the Quaternary sediments, the Tertiary Pliocene and the Upper Miocene sediments are represented by the sand, gravel, silt and clay which was built-up by rivers as coalescing fans on and near the continent and as marine and lagoonal deposits along the coast. The Pliocene includes sediments assigned to the Goliad Sand and the Upper Miocene includes the Fleming Formation.

The Beaumont formation weathers into rich, dark soils, which are assigned to the Lake Charles association, and can be as thick as 72 inches. The surface layer consists of 22 inches of firm, neutral, black clay; the next 14 inches is a dark gray, firm, mildly alkaline clay. This sequence is in turn underlain by 16 inches of dark gray, mildly alkaline clay, with intersecting slickensides. The remaining 22 inches or so is a very firm, mildly alkaline, gray clay that is a mottled olive brown to yellowish brown. The solum is somewhat poorly drained, with very slow runoff. Permeability and internal drainage are very slow (less than 4.24×10^{-5} cm/sec). When dry, the soil displays deep wide cracks on the surface. Water enters rapidly through these cracks, but when the soil is wet and the cracks are sealed, water entry is very slow. The information pertaining to soils contained in the text was derived from the Soil Survey of Harris County, Texas (United States Department of Agriculture, Soil Conservation Service, August 1976).



SOURCE: St. Clair, A. E. et al, Land and Water Resources-Houston/Galveston Area Council, Bureau of Economic Geology, 1975.

Figure III.3

Surficial Geologic Map of the Area

Era	System	Series	Stratigraphic Units		Hydrogeologic Units	Remarks
CENOZOIC	Quaternary	Holocene	Alluvium		Chicot aquifer	Quaternary System undifferentiated on sections.
		Pleistocene	Beaumont Clay			
			Montgomery Formation			
			Bentley Formation			
			Willis Sand			
	Tertiary	Pliocene	Goliad Sand		Evangeline aquifer	
		Miocene	Fleming Formation		Burkeville confining system	
			Oakville Sandstone		Jasper aquifer	Oakville Sandstone included in Fleming Formation east of Washington County.
		? ?	Surface: Catahoula Sandstone	Subsurface: Upper part of Catahoula Sandstone		
				Anahuac Formation	Catahoula confining system (restricted)	Anahuac and "Frio" Formations may be Oligocene in age.
				"Frio" Formation		
		Pre-Miocene rocks				

SOURCE: Baker, E. T., Jr., Hydrology of the Jasper Aquifer in the Southeast Texas Coastal Plain, Texas Water Development Board, Report 295, 1986.

Figure III.4

Generalized Stratigraphic and Hydrologic Column of the Southeast Texas Coastal Plain

C. Hydrology

1. Surface Water

The Station is located in the San Jacinto/Trinity River/Galveston Bay drainage basin. Surface runoff is through storm drains into open ditches parallel to Spencer Highway (Figure III.5). Eventually, this surface drainage enters Galveston Bay via Big Island Slough (west of the Station) and/or Little Cedar Bayou (east of the Station). The Station has been classified as being outside the 100-year flood plain.

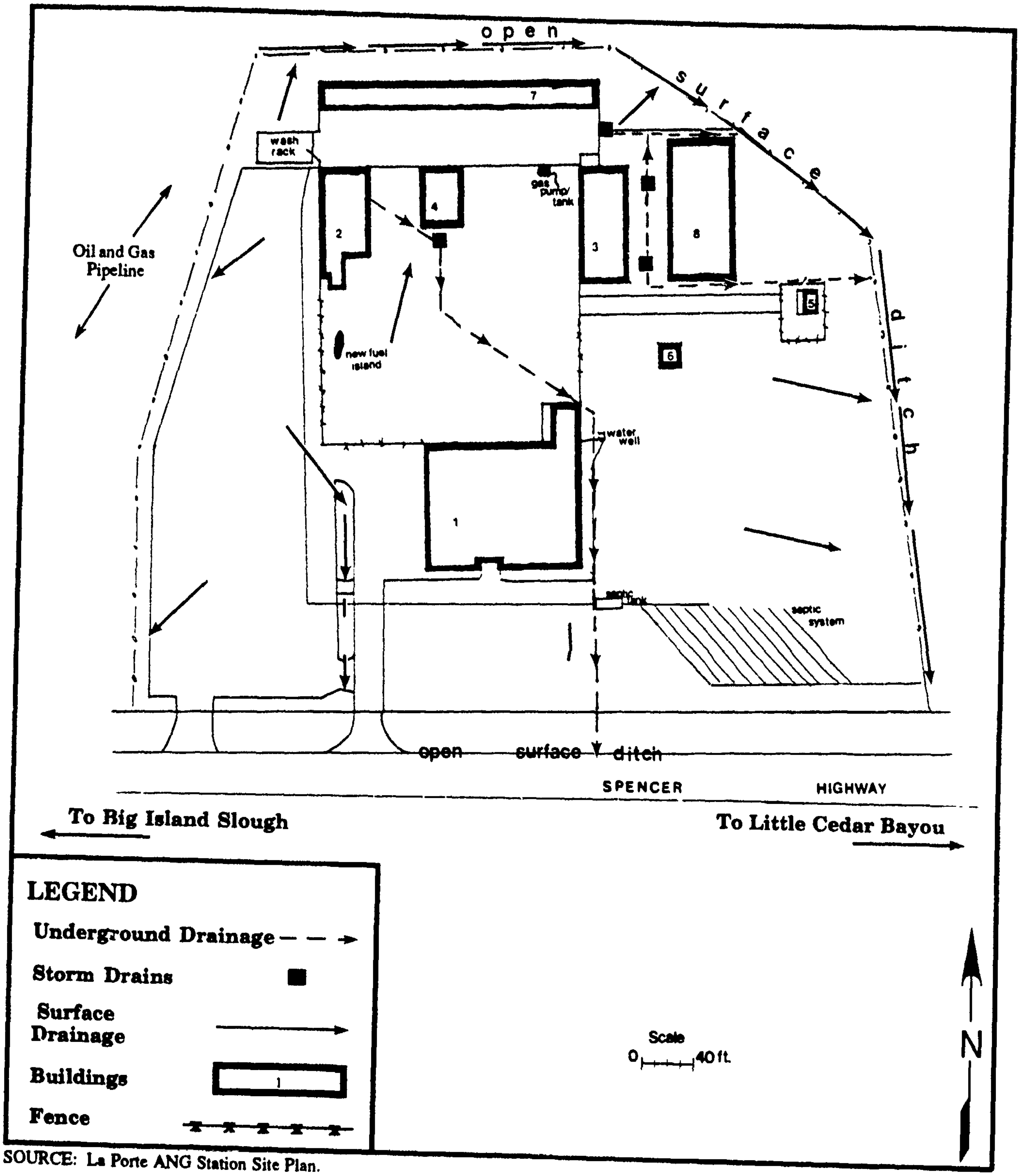
2. Groundwater

All of the groundwater in the vicinity of the Station exists under confined conditions beneath the sand-poor Beaumont aquitard and are contained mostly within sands of Tertiary Pliocene and Quaternary Pleistocene ages. These aquifers are, from youngest to oldest: Chicot, Evangeline, and Jasper. These southeast Texas coastal aquifers are typical in that they are three-dimensional sedimentary wedges which have a large sand-to-clay ratio (Figures III.6, III.7).

Historically, the Chicot aquifer includes all of the Quaternary Pleistocene stratigraphic units, and, at one time, it served as the main source of groundwater in southern Harris county, including the Station, and to the south in Galveston County. Near the coastline, this unit attains a thickness of approximately 1200 feet (Gabrysch, 1975; and Baker, 1986).

The base of the Chicot aquifer has an elevation of 600 feet below mean sea level in the vicinity of the Station and consists of a basal sand unit referred to as the Willis Formation or Alta Loma sand. This sand unit has a relatively large (as much as 75 feet/day) hydraulic conductivity and displays a current water level (spring 1989) of approximately 125 feet below mean sea level in the La Porte area (Baker, 1986). Prior to the development of major surface water sources, water levels fluctuated by as much as 30 feet in the La Porte area (Figure III.8, III.9). Because the city of La Porte has not yet completed its pumping facilities, Chicot groundwater wells still supply all potable water demands for city-wide use (including the Station).

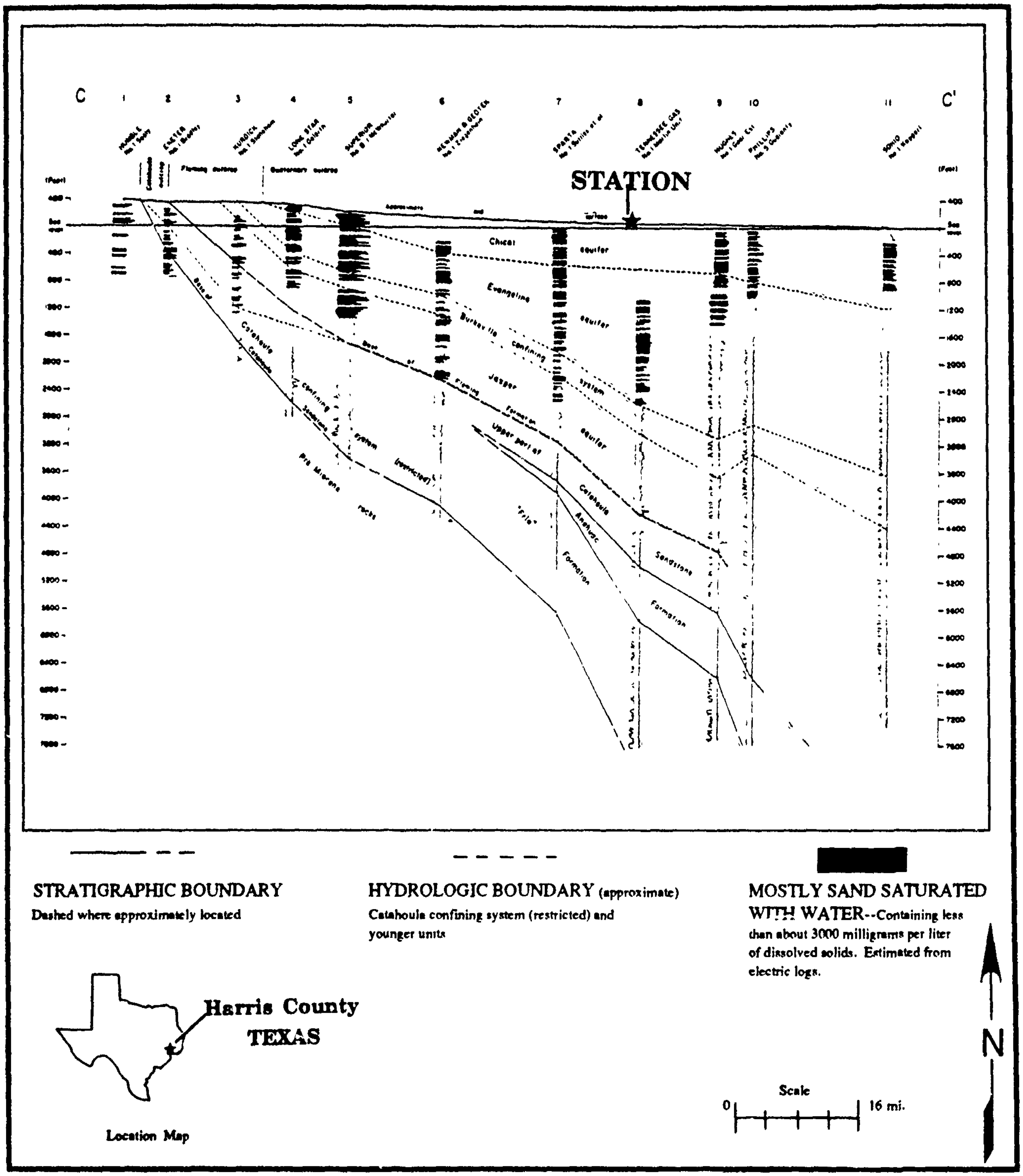
A Chicot water well was drilled at the Station by the ANG in 1949. This well had a drilled depth of 451 feet, and screens were originally set between 405 and 435 feet. The well serviced the Station as well as the adjoining airport facilities, on the east and west, from 1949 to 1977 when La Porte city utilities became available. Although the surface turbine electrical pump as well as the downhole submergible pump and tubing were removed, the cement wellhead pump base and original 4-inch casing are still in place.



SOURCE: La Porte ANG Station Site Plan.

Figure III.5

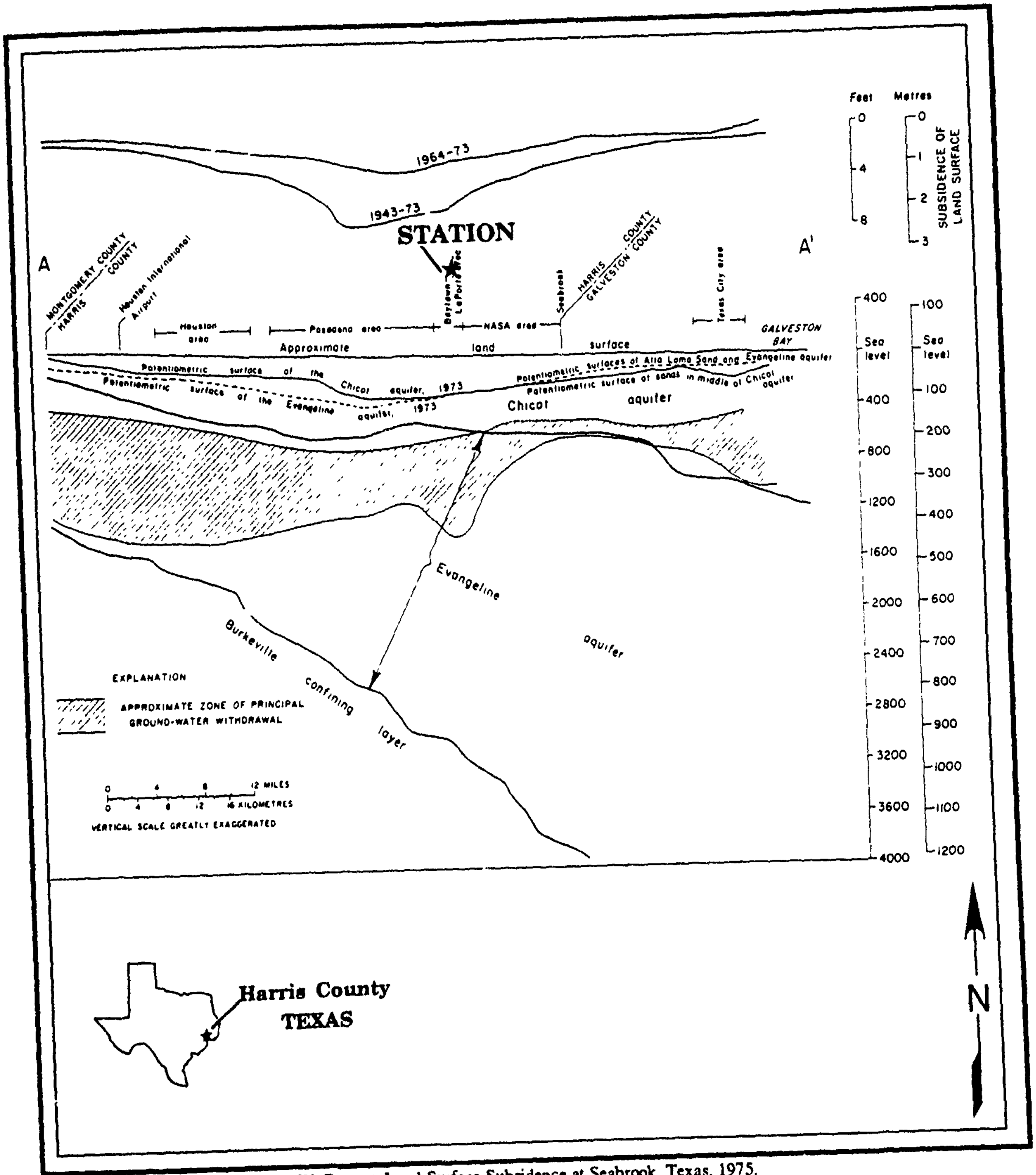
Drainage Map of the La Porte Air National Guard Station



SOURCE: Baker, E. T., Jr.

Figure III.6

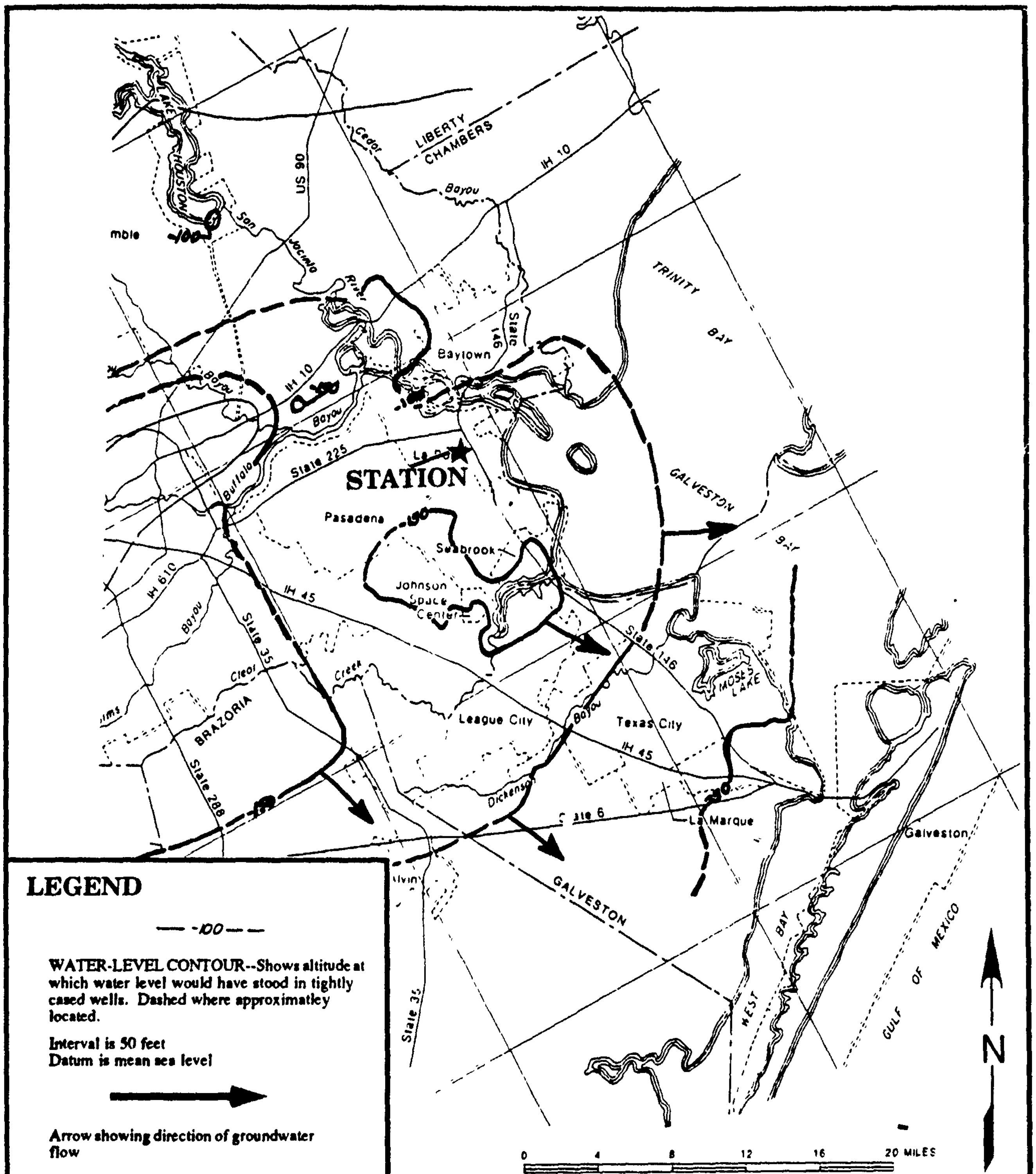
Stratigraphic and Hydrologic Section of the Area



SOURCE: Gabrysch, R. K. and C. W. Bonnet, Land-Surface Subsidence at Seabrook, Texas, 1975.

Figure III.7

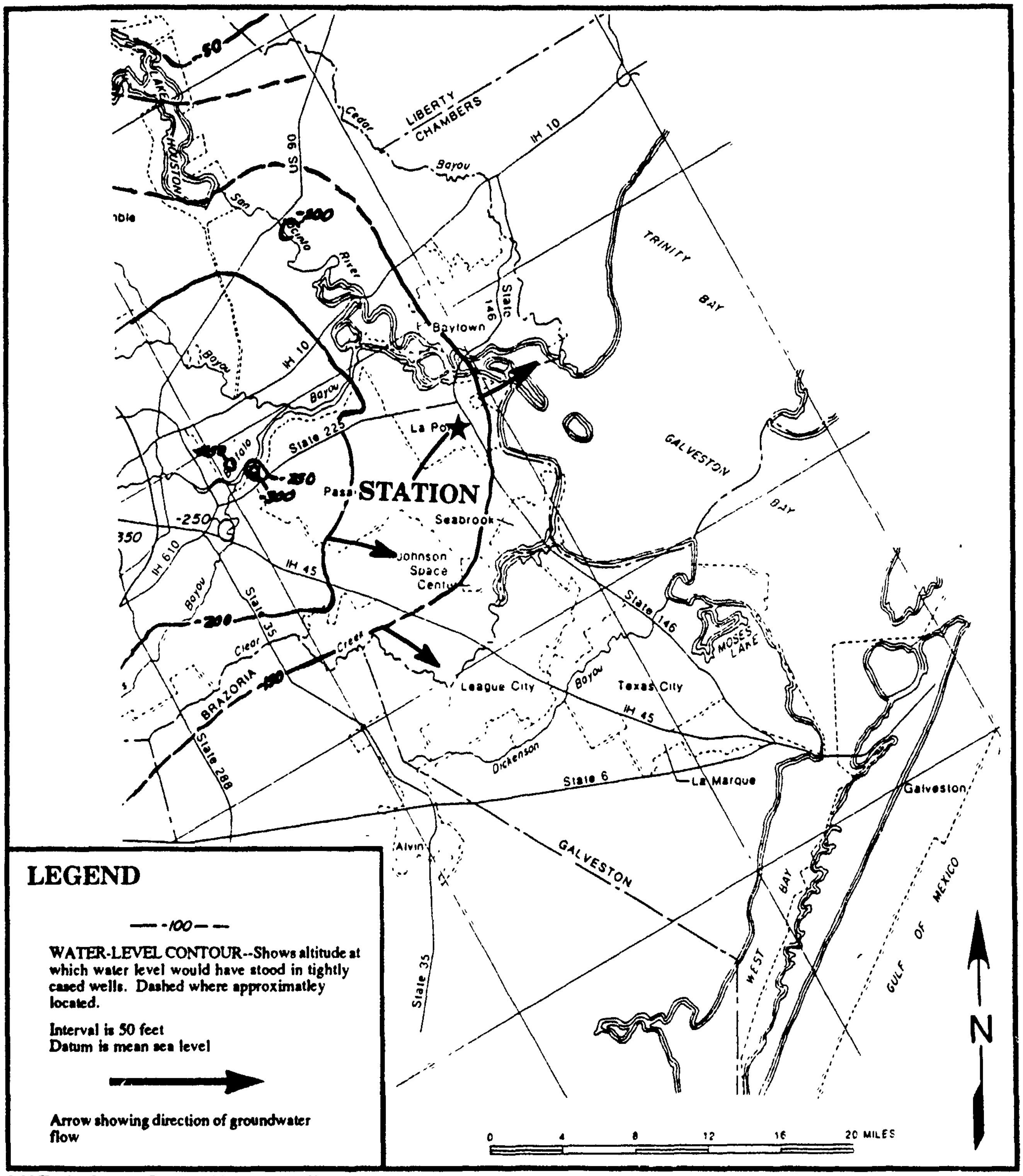
Hydrologic Profile Showing Aquifers, Principal Zones of Groundwater Withdrawal, Altitudes of the Potentiometric Surfaces, and Land-Surface Subsidence



SOURCE: Barbie, D. et al, USGS Open-File Report 89-237 (sheet 1 of 2).

Figure III.8

Approximate Altitude of Water Levels in the Lower Chicot Aquifer, Spring 1989



SOURCE: Barbie, D. et al, USGS Open-File Report 89-237 (sheet 1 of 2)

Figure III.9

Approximate Altitude of Water Levels in the Evangeline Aquifer, Spring 1989

Immediately below the Chicot aquifer, and sometimes without any apparent lithologic separation, the Evangeline aquifer is present (Figures III.6, III.7). This Pliocene aquifer consists of the Goliad Sand unit and generally has a lower hydraulic conductivity as well as a different water level than the shallower Chicot aquifer. The Evangeline aquifer was the major source for groundwater for the Houston municipal district prior to the development of surface water sources in the late 1970s. In the La Porte area, the Evangeline is saline and is not used as a groundwater source. Near the outcrop, the Evangeline ranges in thickness from about 400 to 600 feet. Near the coastline, its thickness is approximately 2300 feet.

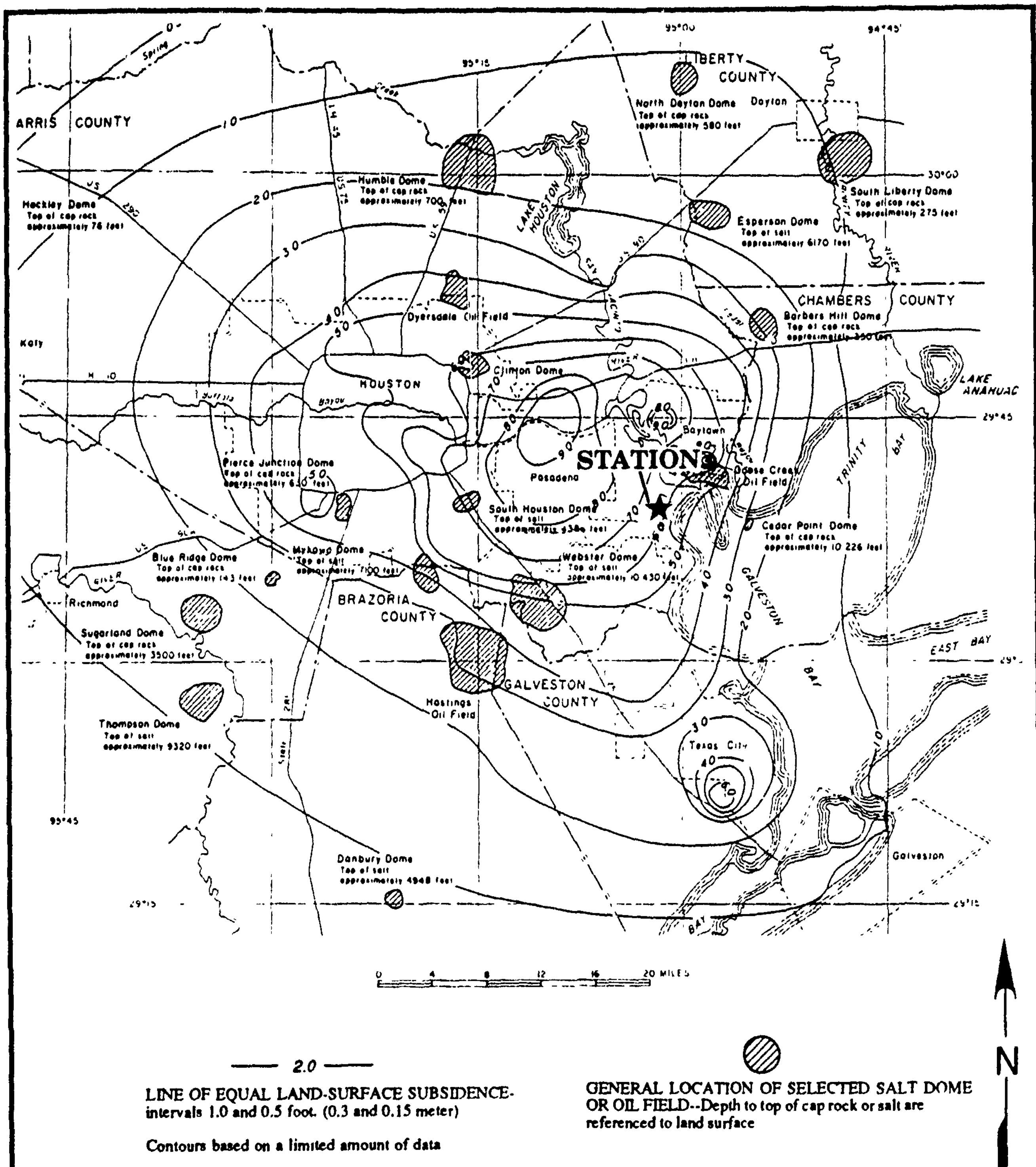
The Upper Miocene Jasper aquifer, which underlies both the Chicot and Evangeline, is not used as a groundwater source except north of Houston, in an arcuate belt subparallel to the present coastline. In the La Porte area, the top of the Jasper aquifer is at a depth of approximately 3400 feet below mean sea level, and the waters are saline in nature (Figure III.6).

Regional as well as local variations in sand thickness and fresh-saline water interface occur because of the effect of growth faulting (down-to-the-coast). In the area surrounding the Station, faulting does not appear to play a significant role.

According to the United States Geological Survey (Gabrysch, 1984), subsidence due to groundwater and/or petroleum withdrawal has exceeded 6 feet during the period from 1906-1978 (Figure III.10). As a result of surface water sources being developed for major municipal and industrial users, relative stability in subsidence rates has been achieved because of decreased aquifer withdrawals.

D. Critical Habitats/Endangered or Threatened Species

According to records maintained by the Texas Parks and Wildlife Department, no endangered or threatened species of flora or fauna have been identified within a 1-mile radius of the Station.



SOURCE: Gabrysch, R. K., Ground Water Withdrawals and Land-Surface Subsidence in the Houston-Galveston Region, Texas, 1906-80, Texas Department of Water Resources, Report 287, 1984

Figure III.10

Approximate Land-Surface Subsidence, 1906-78

IV. SITE EVALUATION

A. Activity Review

A review of Station records and interviews with personnel were used to identify specific operations in which the majority of hazardous materials and/or hazardous wastes are used, stored, disposed of, and processed. Table IV.1 provides a history of waste generation and disposal for operations conducted by the Vehicle Maintenance Shop at the Station. This Shop also performs maintenance on AGE equipment when necessary. If an item is not listed on the table on a best-estimated basis, that activity or operation produces negligible (less than 1 gallon/year) waste requiring disposal.

Fresh product gasoline and diesel fuel are stored in underground, fiberglass tanks located at the new fuel island just south of Building 2. These tanks were installed in 1988. The original fuel island is no longer being used. It has been abandoned since 1982, when inventory checks revealed that water was entering the tank.

The 272nd EIS generates hazardous wastes primarily through vehicle and AGE maintenance operations. Over the years, these wastes normally have been collected and stored until disposed of by a contractor.

The Station was connected to city water and sanitary sewer in the late 1970s. These utilities are provided by the city of La Porte. Prior to the sanitary sewer connection, the Station used a septic field system. Only the bathroom facilities and a sink in the Vehicle Maintenance Shop (Building 2) and Headquarters (Building 1) were connected to the septic system. The floor drains in the shops empty into the storm sewer.

The vehicle washrack is located on the north side of the Vehicle Maintenance Shop (Building 2). It is connected to an oil/water separator that is joined to the sanitary sewer system.

The potable water supply for the Station has been provided by the city of La Porte since the late 1970s. Prior to that time, the Station received water from an on-site water well. This well was drilled by the Air National Guard in 1949 and is located on the east side of the Armory (Building 1). This well also supplied water to the hangars on the east and west side of the Station until it was abandoned in 1977. Both a surface electrical turbine pump and a submersible pump have been used for this well. However, these pumps and their associated tubing have been removed. The cement wellhead pump base and the original 4-inch casing are still in place.

Table IV.1

Hazardous Materials/Hazardous Wastes Disposal Summary: La Porte Air National Guard Station, La Porte, Texas.

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal 1951 – 1965 – 1975 – 1985 – 1990
Vehicle Maintenance (Bldg. 2)	Engine Oil	100	CONTR
	Battery Acid	10	NSEPTIC, NSAN, CONTR
	Ethylene Glycol	20	STORM, CONTR
	Transmission Fluid	20	CONTR
	Paint Thinner	10	CONTR, NLU
	Paint	10	CONTR, NLU
	PD-680	50	CONTR, NLU
	Safety Kleen	360	NIU, CONTR

KEY:

CONTR - Disposed of through a Contractor.
NIU - Material not in use at this time.
NLU - Material is no longer used at the Station.
NSAN - Neutralized and disposed of down drains leading to the sanitary sewer.
NSEPTIC - Neutralized and disposed of down drains leading to the septic system.
STORM - Disposed of down drains leading to the storm sewer.

B. Disposal/Spill Site Information, Evaluation, and Hazard Assessment

Five persons were interviewed to identify and locate potential sites that may have been contaminated by hazardous wastes as a result of past Station operations. Two potentially contaminated sites were identified through the interviews. These site identifications were followed by visual field examinations of the sites. These sites were rated by application of the United States Air Force (USAF) HARM, and since the potential for contaminant migration exists they are recommended for further investigation under the IRP program. Copies of completed HARM forms and an explanation of the factor rating criteria used for sites scoring are contained in Appendix C.

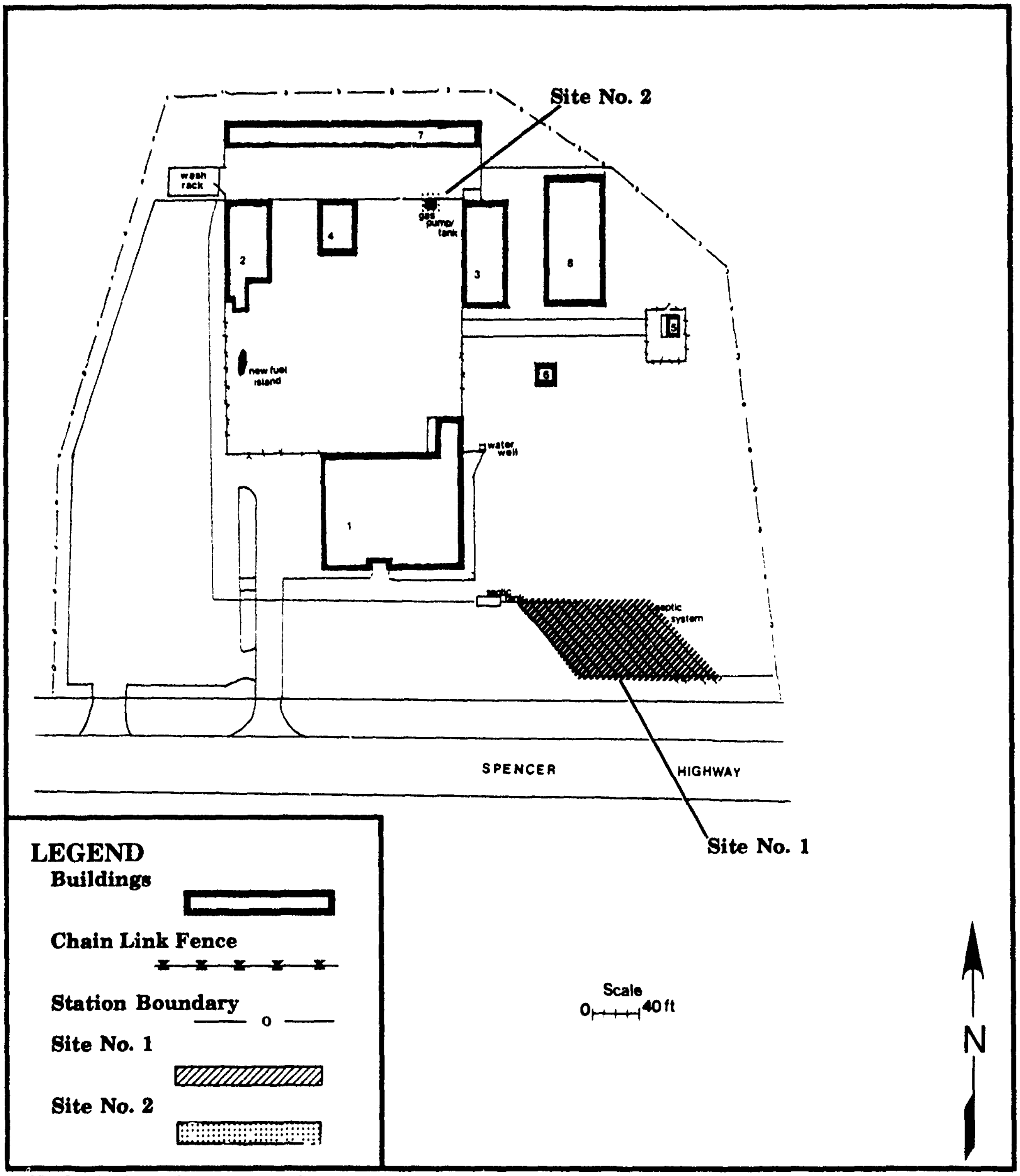
The potential exists for contaminant migration at the rated sites. Contaminants that may have been released have the potential to be transported by groundwater and surface water. The water table is less than 10 feet below the ground surface at the Station. If the shallow groundwater becomes contaminated by hazardous wastes, then, under certain circumstances, the deeper aquifers may also be contaminated by groundwater migration.

Locations for the identified sites are shown on Figure IV.1. Descriptions of the potential sites identified at the Station follow.

Site No. 1 - Abandoned Septic System (HAS - 65)

An abandoned septic system is located southeast of the Armory (Building 1) and north of Spencer Highway. This septic system was used from 1949 until the Station connected to sanitary sewer service in the late 1970s. Prior to this, the lavatory drains in the Vehicle Maintenance Shop (Building 2) and in the Armory were connected to piping that emptied into the septic tank and the drain field. The floor drains in the shops are connected to the storm sewer system. The drains in the battery shop (Building 2) emptied into the septic system until the sanitary sewer was connected in the late 1970s. Through the years, battery acid was neutralized and/or diluted and then was poured down these drains. As a result, the septic system could contain contaminants from batteries that might migrate into the soil and/or groundwater.

Exact quantities that may have been released into the septic system are not known. However, because of the small amount of wastes generated and disposed of by the Station, a small quantity is assigned to this potential site. In addition, a high hazard rating is assigned because of the toxicity of metals found in batteries.



SOURCE: La Porte ANG Station Site Plan

Figure IV.1

Potential Sites

at the La Porte Air National Guard Station

Site No. 2 - Underground Storage Tank at Building 3 (HAS - 63)

An abandoned underground storage tank (UST) is located approximately 20 feet south of Building 7 and north-northwest of Building 3. This area is the site of the original fuel island as indicated by the presence of the gasoline pump. According to property records, this 2000-gallon steel tank was installed in 1963 and contained automotive gasoline (MOGAS). The tank was abandoned in 1982 because inventory checks revealed that water was infiltrating the tank.

Although inventory checks revealed that water was entering the tank, it is not known if any fuel had been released from the tank. Because no exact quantities, if any, are known to have been released in this area a small quantity has been assigned to this potential site. According to HARM, a small quantity is less than 20 drums (1100 gallons). In addition, because of the nature of the fuel disposed of, a high hazard rating will be assigned to this potential site.

C. Other Pertinent Facts

- Trash and nonhazardous solid wastes are disposed of by the city of La Porte.
- Transformers at the Station belong to Houston Light and Power.
- The Station does not have a National Pollutant Discharge Elimination System (NPDES) permit.

V. CONCLUSIONS

Information obtained through interviews with five present and past Station personnel, reviews of Station records, and field observations resulted in the identification of two potentially contaminated disposal and/or spill sites on Station property. These potential sites are as follows:

Site No. 1 - Abandoned Septic System (HAS - 65)

Site No. 2 - Underground Storage Tank at Building 3 (HAS - 63)

These sites exhibit the potential for contaminant migration into shallow groundwater.

VI. RECOMMENDATIONS

The PA identified two potentially contaminated sites. As a result, additional investigation under the IRP is recommended for these sites to confirm the presence or absence of contamination.

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GLOSSARY OF TERMS

ALLUVIAL - Pertaining to or composed of alluvium or deposited by a stream or running water.

ALLUVIAL FAN - An outspread, gently sloping mass of alluvium deposited by a stream, especially in an arid or semiarid region where a stream issues from a narrow canyon onto a plain or valley floor.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

AQUIFER - A water-bearing layer of rock that will yield water in a usable quantity to a well or spring.

AQUITARD - A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer.

ARGILLACEOUS - Like or containing clay.

BASIN - (a) A depressed area with no surface outlet; (b) A drainage basin or river basin; (c) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated.

BAY - A wide, curving open indentation, recess, or inlet of a sea or lake into the land or between two capes or headlands, larger than a cove, and usually smaller than, but of the same general character as a gulf.

BED [stratig] - The smallest formal unit in the hierarchy of lithostratigraphic units. In a stratified sequence of rocks it is distinguishable from layers above and below. A bed commonly ranges in thickness from a centimeter to a few meters.

BEDDING [stratig] - The arrangement of sedimentary rock in beds or layers of varying thickness and character.

BEDROCK - A general term for the consolidated (solid) rock that underlies soil or other unconsolidated superficial material. See HORIZON [soil] - *R layer.*

CLASTIC - Rock or sediment composed principally of fragments derived from pre-existing rocks or minerals and transported some distance from their place of origin.

CLAY [soil] - A rock or mineral particle in the soil having a diameter less than 0.002 mm (2 microns).

CLAY [geol] - A rock or mineral fragment or a detrital particle of any composition smaller than a fine silt grain, having a diameter less than 1/256 mm (4 microns).

COARSE-TEXTURED (light textured) SOIL - Sand or loamy sand.

COMPRESSIBILITY - The change of volume and density under hydrostatic pressure.

CONE OF DEPRESSION - The depression of heads around a pumping well caused by the withdrawal of water.

CONGLOMERATE - A coarse-grained sedimentary rock, composed of rounded pebbles, cobbles, and boulders, set in a fine-grained matrix of sand or silt, and commonly cemented by calcium carbonate, iron oxide, silica, or hardened clay.

CONSOLIDATION - Any process whereby loosely aggregated, soft, or liquid earth materials become firm and coherent rock; specif. the solidification of a magma to form an igneous rock, or the lithification of loose sediments to form a sedimentary rock.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under

the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CONTEMPORANEOUS FAULT - See GROWTH FAULT.

CREEK - A term generally applied to any natural stream of water, normally larger than a brook but smaller than a river.

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process or agent.

DRAINAGE CLASS (natural) - Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained - Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained - Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well-drained - Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does

not inhibit growth of roots for significant periods during most growing seasons. Well-drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained - Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained - Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained - Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough periods during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained - Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

DRAINAGEWAY - A channel or course along which water moves in draining an area.

DRAWDOWN - The reduction in head at a point caused by the withdrawal of water from an aquifer.

EMBAYMENT - A downwarped region of stratified rocks that extends into a region of other rocks.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range. other than a species of the Class Insecta determined by the secretary to constitute a pest whose protection would present an overwhelming and overriding risk to man.

EROSION - The general process or the group of processes whereby the materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies, but usually exclude mass wasting.

FAULT - A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.

FINE-GRAINED - Said of a soil in which silt and/or clay predominate.

FINE-TEXTURED (heavy textured) SOIL - Sandy clay, silty clay, and clay.

FLOOD PLAIN - The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks.

FOLD [geol struc] - A curve or bend of a planar structure such as rock strata, bedding planes, foliation or cleavage.

FORMATION - A lithologically distinctive, mappable body of rock.

FRACTURE [struc geol] - A general term for any break in a rock, whether or not it causes displacement, due to mechanical failure by stress. Fracture includes cracks, joints, and faults.

GEOLOGIC TIME - See Figure Gl.1.

GRANITE - Broadly applied, any crystalline, quartz-bearing plutonic rock; also commonly contains feldspar, mica, hornblende, or pyroxene.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GROUNDWATER - Water in the saturated zone that is under a pressure equal to or greater than atmospheric pressure.

GROWTH FAULT - A fault in sedimentary rock that forms contemporaneously and continuously with deposition, so that the displacement (throw) increases with depth and the strata of the downthrown side are thicker than the correlative strata of the upthrown side.

The Geologic Time Scale
(Numbers are in millions of years before the present)

Eon	Era	Period		Epoch	
Phanerozoic	Cenozoic	Quaternary		Recent or Holocene	
				Pleistocene	2
		Tertiary	Neogene	Pliocene	5
				Miocene	24
			Paleogene	Oligocene	37
				Eocene	58
				Paleocene	66
	Mesozoic	Cretaceous			144
		Jurassic			208
		Triassic			245
	Paleozoic	Permian			286
		Carboniferous	Pennsylvanian		320
			Mississippian		360
		Devonian			408
		Silurian			438
		Ordovician			505
		Cambrian			570
Precambrian	Proterozoic Eon			Precambrian Comprises About 87% of the Geologic Time Scale	2500
	Archean Eon				3800
	No Record			Origin of Earth	

Figure Gl.1

The Geologic Time Scale

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, December 11, 1981.)

HAS - Hazard Assessment Score - The score developed by using the Hazard Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HEAD - See TOTAL HEAD.

HERBICIDE - A weed killer.

HIGHLAND - A general term for a relatively large area of elevated or mountainous land standing prominently above adjacent low areas; and mountainous region.

HILL - A natural elevation of the land surface, rising rather prominently above the surrounding land, usually of limited extent and having a well-defined outline (rounded) and generally considered to be less than 1000 feet from base to summit.

HORIZON [soil] - A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon - An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon - The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral

material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon - A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon - The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon - The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer - Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

HYDRAULIC CONDUCTIVITY - The rate of flow of water in gallons per day through a cross section of one square foot under a unit hydraulic gradient, at the prevailing temperature or adjusted for a temperature of 60°F

IGNEOUS ROCKS - Rock or mineral that has solidified from molten or partially molten material, i.e. from magma.

INTERBEDDED - Beds lying between or alternating with others of different character; especially rock material laid down in sequence between other beds.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal proportions of sand, silt, and clay particles, and usually containing organic matter.

LOWLAND - A general term for low-lying land or an extensive region of low land, esp. near the coast and including the extended plains or country lying not far above tide level.

MEANDERBELT - The zone along a valley floor across which a meandering stream shifts its channel from time to time.

MEAN LAKE EVAPORATION - The total evaporation amount for a particular area; amount based on precipitation and climate (humidity).

MEAN SEA LEVEL - The average height of the surface of the sea for all stages of the tide over a 19-year period.

METAMORPHIC ROCK - Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the Earth's crust.

MIGRATION (Contaminant) - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

MINERAL - A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form and physical properties.

MONTMORILLONITE - A clay mineral of the smectite group comprising expanding-lattice clay minerals when wetted.

MOTTLED [soil] - a soil that is irregularly marked with spots or patches of different colors, usually indicating poor aeration or seasonal wetness.

NET PRECIPITATION - Precipitation minus evaporation.

OUTCROP - That part of a geologic formation or structure that appears at the surface of the Earth; also, bedrock that is covered only by surficial deposits such as alluvium.

OVERTURNED - Said of a fold or the limb of a fold, that has tilted beyond the perpendicular. Sequence of strata thus appears reversed.

PD-680 - A cleaning solvent composed predominately of mineral spirits; Stoddard solvent.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure - see SOIL PERMEABILITY.

POND - A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger then a pool.

POROSITY - The voids or openings in a rock. Porosity may be expressed quantitatively as the ratio of the volume of openings in a rock to the total volume of the rock.

POTENTIOMETRIC SURFACE - A surface that represents the total head in an aquifer; that is, it represents the height above a datum plane at which the water level stands in tightly cased wells that penetrate the aquifer.

PROGRADE - To build outward towards the sea by deposition of sediment.

QUARTZ - A crystalline silica, an important rock forming mineral: SiO_2. Occurs either in transparent hexagonal crystals (colorless or colored by impurities) or in crystalline or cryptocrystalline masses. Forms the major proportion of most sands and has a widespread distribution in igneous, metamorphic and sedimentary rocks.

RIFT - A long, narrow continental trough bounded by normal faults.

RIVER - A general term for a natural freshwater surface stream of considerable volume and a permanent or seasonal flow, moving in a definite channel toward a sea, lake, or another river.

SALINE [adj] - Salty; containing dissolved sodium chloride.

SAND - A rock or mineral particle in the soil, having a diameter in the range 0.52 - 2 mm.

SANDSTONE - A medium-grained fragmented sedimentary rock composed of abundant round or angular fragments of sand, size set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material (commonly silica, iron oxide, or calcium carbonate).

SANDY LOAM - A soil containing 43 - 85% sand, 0 - 50% silt, and 0 - 20% clay, or containing at least 52% sand and no more than 20% clay and having the percentage of silt plus twice the percentage of clay exceeding 30% or containing 43 - 52% sand, less than 50% silt, and less than 7% clay.

SATURATED ZONE - The subsurface zone in which all openings are full of water.

SEDIMENT - Solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water, or ice, or that accumulates by other natural agents, such as chemical precipitation from solution or secretion by organisms, and that forms in layers on the Earth's surface at ordinary temperatures in a loose, unconsolidated form, (b) strictly solid material that has settled down from a state of suspension in a liquid.

SEDIMENTARY ROCK - A rock resulting in the consolidation of loose sediment that has accumulated in layers; e.g., a clastic rock (such as conglomerate or tillite) consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice; or a chemical rock (such as rock salt or gypsum) formed by precipitation from solution; or an organic rock (such as certain limestones) consisting of the remains or secretions of plants and animals.

SHALE - A fine-grained detrital sedimentary rock, formed by the consolidation (especially by compression) of clay, silt, or mud.

SILT [soil] - (a) A rock or mineral particle in the soil, having a diameter in the range 0.002-0.005 mm; (b) A soil containing more than 80% silt-size particles, less than 12% clay, and less than 20% sand.

SILT LOAM - A soil containing 50 - 88% silt, 0 - 27% clay and 0 - 50% sand.

SLICKENSIDE - A polished and striated rock surface that results from friction along a fault plane.

SOIL - The layer of material at the land surface that supports plant growth.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as the distance per unit time that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	-	less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	-	0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	-	0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)
Moderate	-	0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)
Moderately Rapid	-	2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)
Rapid	-	6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)

Very Rapid	-	more than 20.00 inches per hour (more than 1.41 x 10^{-2} cm/sec)

(Reference: United States Department of Agriculture, Soil Conservation Service)

SOIL REACTION - The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests at pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Miidly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

SOIL STRUCTURE - See STRUCTURE [soil].

SOLUM - The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons ar unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum. See HORIZON [soil].

SOLVENT - A substance, generally a liquid, capable of dissolving other substances.

STRAND PLAIN - A prograded shore built seaward by waves and currents, and continuous for some distance along the coast.

STRATIFIED - Formed, arranged, or laid down in layers or strata; especially said of any layered sedimentary rock or deposit.

STRIKE - SLIP FAULT - A fault on which the movement is parallel to the fault's strike. See TRANSCURRENT FAULT.

STRUCTURE [soil] - The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are - platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

SUBSOIL - Technically, the B horizon; roughly, the part of the solum below plow depth.

SUBSTRATUM - The part of the soil below the solum.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

SYNCLINORIUM - A composite synclinal structure of regional extent composed of lesser folds.

TERRACE [geomorph] - Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope.

TERRACE [soil] - A horizontal or gently sloping ridge or embankment of earth built along the contours of a hillside for the purpose of conserving moisture, reducing erosion, or controlling runoff.

TERRIGENOUS DEPOSITS - Shallow marine sediment consisting of material eroded from the land surface.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

TIME [geol] - See Figure Gl.1.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and man-made features.

TOTAL HEAD - The height above a datum plane of a column of water. In a groundwater system, it is composed of elevation head, pressure head, and velocity head.

TRANSCURRENT FAULT - A large scale strike - slip fault in which the fault surface is steeply inclined.

UNCONSOLIDATED - (a) Sediment that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth. (b) Soil material that is in a loosely aggregated form.

VALLEY - Any low-lying land bordered by higher ground, especially an elongate, relatively large, gently sloping depression of the earth's surface, commonly situated between two mountains or between ranges of hills and mountains, and often containing a stream or river with an outlet. It is usually developed by stream or river erosion, but can be formed by faulting.

WATER TABLE - The level in the saturated zone at which the pressure is equal to the atmospheric pressure.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

Appendix A

Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1) Bureau of Economic Geology
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University Station, Box X
Austin, TX 78713
(512) 471-1534

2) Department of the Air Force
147th FIG/DE
1057 Ellington Field
Houston, TX 77034-5586
Major Sheila F. Hooten, Base Civil Engineer
(713) 929-2781

3) Houston-Galveston Subsidence District
1660 West Bay Area Boulevard
Friendswood, TX 77546
Ron Neighbors or Bud Holschuh
(713) 486-1105

4) Texas Parks and Wildlife
Resources Protection Division
4200 Smith School Road
Austin, TX 78744
Robert Spain
Dorinda Sullivan
(512) 448-4311

5) Texas Water Commission
P.O. Box 13087
Austin, TX 78711-3087
(512) 463-8028

6) Texas Water Development Board
611 South Congress
Austin, TX 78704
Bernie Baker
(512) 445-1425
Richard Preston
(512) 445-1439

7) United States Department of Agriculture
Soil Conservation Service
1132A North Dallas Avenue
Lancaster, TX 75146-1620

OUTSIDE AGENCY CONTACT LIST (continued)

8) United States Department of Agriculture
Soil Conservation Service
8245 Gladys, Suite 201
Beaumont, TX 77706

9) United States Department of Commerce
National Oceanic and Atmospheric Administration
National Climatic Data Center
Federal Building
Asheville, NC 28801
(704) 259-0871

10) United States Geological Survey
2320 La Branch Street
Room 1112
Houston, TX 77004
Bob Gabrysch
(713) 750-1656

11) United States Geological Survey
Water Resources Division
8011 Cameron Road, Building 1
Austin, TX 78753

Appendix B

USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The DoD has developed a comprehensive program to identify, evaluate, and control hazardous waste disposal practices associated with past waste disposal techniques at DoD facilities. One of the actions required under this program is to:

> Develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts (Reference: DEQPPM 81-5, December 11, 1981).

Accordingly, the USAF has sought to establish a system to set priorities for taking further action at sites based upon information gathered during the PA phase of the IRP.

PURPOSE

The purpose of the site rating model is to assign a ranking to each site where there is suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-up site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous waste present in sufficient quantity), and (2) potential for migration exists. A site may be deleted from ranking consideration on either basis.

DESCRIPTION OF THE MODEL

Like the other hazardous waste site ranking models, the USAF's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors presented in this appendix. The site rating form and the rating factor guidelines are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: (1) possible receptors of the contamination, (2) the waste and its characteristics, (3) the potential pathways for contaminant migration, and (4) any effort that was made to contain the waste resulting from a spill.

The receptors category rating is based on four rating factors: (1) the potential for human exposure to the site, (2) the potential for human ingestion of contaminants should underlying aquifers be polluted, (3) the current and anticipated use of the surrounding area, and (4) the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 X factor subtotal/maximum score subtotal).

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score while scores for solids are reduced.

The pathways category rating is based on evidence of contaminant migration along one of three pathways: surface water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well-managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the score for the other three categories.

HAZARD ASSESSMENT RATING FORM

NAME OF SITE

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site		4		12
B. Distance to nearest well		10		30
C. Land use-zoning within 1-mile radius		3		9
D. Distance to installation boundary		6		18
E. Critical environments within 1-mile radius of site		10		30
F. Water quality of nearest surface water body		6		18
G. Groundwater use of uppermost aquifier		9		27
H. Population served by surface water supply within 3 miles downstream of site		6		18
I. Population served by groundwater supply within 3 miles of site		6		18

Subtotals ________ 180

Receptors subscore (100 x factor score subtotal/maximum score subtotal)

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ________
2. Confidence level (C = confirmed, S = suspected) ________
3. Hazard rating (H = high, M = medium, L = low) ________

Factor Subscore A (from 20 to 100 based on factor score matrix)

B. Apply persistence factor
Factor subscore A x Persistence Factor = Subscore B

________ x ________ = ________

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

________ x ________ =

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24

Subtotals ________ 108

Subscore (100 x factor score subtotal/maximum score subtotal)

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		3

Subscore (100 x factor score/3)

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater		8		24
Net precipitation		6		18
Soil permeability		8		24
Subsurface flows		8		24
Direct access to groundwater		8		24

Subtotals ________ 114

Subscore (100 x factor score subtotal/maximum score subtotal)

C. Highest pathway score

Enter the highest subscore value from A, B-1, B-2, or B-3 above

Pathways subscore

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and patnways.

Receptors
Waste Characteristics
Pathways

Total ________ divided by 3 = ________

Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

________ x ________ = $\boxed{}$

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land use/zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Groundwater use of uppermost aquifer	Not used, other sources readily available	Commercial industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available, commercial, industrial, or irrigation; no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability, and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	H
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	H
	L	C	L
	M	S	M
	S	C	H
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical state	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, groundwater, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

Rating Factors	0	1	2	3	Multiplier
B-1 Potential for Surface Water Contamination					
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to a mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year, 24 hour rainfall (thunderstorms)	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8
	0-5	6-35	36-49	>50	
	0	30	60	100	
B-2 Potential for Flooding					
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1
B-3 Potential for Groundwater Contamination					
Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($<10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay 10^{-2} to 10^{-4} cm/sec	0% to 15% clay ($>10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high groundwater level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean groundwater level	8
Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-B-3, then leave blank for calculation of factor score and maximum possible score.

Appendix C

Site Hazard Assessment Rating Forms and Factor Rating Criteria

HAZARD ASSESSMENT RATING FORM

NAME OF SITE Site No. 1 - Abandoned Septic System

LOCATION La Porte Air National Guard Station just north of Spencer Highway

DATE OF OPERATION OR OCCURRENCE 1949 through the late 1970s

OWNER/OPERATOR 272nd EIS (La Porte Air National Guard Station, Texas)

COMMENTS/DESCRIPTION Battery acid was poured down drains leading to septic system.

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use-zoning within 1-mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	2	6	12	18
G. Groundwater use of uppermost aquifier	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	117	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 65

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			74	108

Subscore (100 x factor score subtotal/maximum score subtotal) 69

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	1	8	8	24
Direct access to groundwater	2	8	16	24
Subtotals			62	114

Subscore (100 x factor score subtotal/maximum score subtotal) 54

C. Highest pathway score

Enter the highest subscore value from A, B-1, B-2, or B-3 above

Pathways subscore 69

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	65
Waste Characteristics	60
Pathways	69

Total 194 divided by 3 = 65

Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

65 x 1.0 = $\boxed{65}$

HAZARD ASSESSMENT RATING FORM

NAME OF SITE Site No. 2 - Underground Storage Tank at Building 3

LOCATION Approximately 20 feet south of Building 7 and north-northwest of Building 3

DATE OF OPERATION OR OCCURRENCE 1963-1982

OWNER/OPERATOR 272nd EIS (La Porte Air National Guard Station, Texas)

COMMENTS/DESCRIPTION Inventory checks indicated that water was entering this MOGAS tank.

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use-zoning within 1-mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	2	6	12	18
G. Groundwater use of uppermost aquifier	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18

Subtotals 117 180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 65

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor subscore A x Persistence Factor = Subscore B

60 x 0.9 = 54

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.0 = 54

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			74	108

Subscore (100 x factor score subtotal/maximum score subtotal) 69

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	1	8	8	24
Direct access to groundwater	2	8	16	24
Subtotals			62	114

Subscore (100 x factor score subtotal/maximum score subtotal) 54

C. Highest pathway score

Enter the highest subscore value from A, B-1, B-2, or B-3 above

Pathways subscore 69

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	65
Waste Characteristics	54
Pathways	69

Total 188 divided by 3 = 63

Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

63 x 1.0 = $\boxed{63}$

La Porte Air National Guard Station
La Porte, Texas

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

The following is an explanation of the HARM factor rating criteria for each of the two potential sites.

I. Receptors

A. Population Within 1000 feet of Site.

Site Nos. 1 and 2, Factor Rating 3.
The population within 1000 feet of both sites is over 100. On UTA weekends, the station population is approximately 173 persons.

B. Distance to Nearest Water Well.

Site Nos. 1 and 2, Factor Rating 3.
There is an abandoned water well located on Station property.

C. Land Use-Zoning (within 1-mile radius).

Site Nos. 1 and 2, Factor Rating 3.
The area within a 1-mile radius of both sites is zoned commercial and residential. There are residential neighborhoods located nearby.

D. Distance to Installation Boundary.

Site Nos. 1 and 2, Factor Rating 3.
Site No. 1 is approximately 40 feet from the Station's south boundary along Spencer Highway. Site No. 2 is located approximately 100 feet from the Station's north boundary.

E. Critical Environments (within 1-mile radius).

Site Nos. 1 and 2, Factor Rating 0.
According to the Texas Parks and Wildlife Department, there are no endangered species or critical habitats within a 1-mile radius of the Station.

F. Water Quality/Use Designation of Nearest Surface Water Body.

Site Nos. 1 and 2, Factor Rating 2.
The nearest surface water is Big Island Slough which drains into Galveston Bay. Galveston Bay is used for shellfish harvesting.

G. Groundwater Use of Uppermost Aquifer.

Site Nos. 1 and 2, Factor Rating 2.
The groundwater is used for drinking water; however, municipal water is available in the La Porte area.

H. Population Served by Surface Water Supplies Within 3 Miles Downstream of Site.

Site Nos. 1 and 2, Factor Rating 0.
The local population is supplied with water from groundwater supplies.

I. Population Served by Aquifer Supplies Within 3 Miles Downstream of Site.

Site Nos. 1 and 2, Factor Rating 3.
Municipalities in the La Porte area obtain water from groundwater supplies. The city of La Porte has three wells which are within 3 miles of the Station.

II. Waste Characteristics

Site No. 1

A-1: Hazardous Waste Quantity - Factor Rating S (Small).
It is estimated that only a small quantity (less than 20 drums) of battery acid has been disposed of at this potential site.

A-2: Confidence Level - Factor Rating C (Confirmed).
Several interviewees reported that wastes have been periodically spilled or poured out at this potential site

A-3: Hazard Rating - Factor Rating H (High).
This site was given a high hazard rating because of the high toxicity of lead found within batteries.

Site No. 2

A-1: Hazardous Waste Quantity - Factor Rating S (Small).
It is estimated that only a small quantity (less than 20 drums) of combined liquid wastes; including fuels, solvents, oils, and thinners, may have been released at this site.

A-2: Confidence Level - Factor Rating C (Confirmed).
Several interviewees reported that this abandoned tank was used to store liquid wastes. Based on the tank's construction, age, and inventory records, it may have released hazardous materials into the environment.

A-3: Hazard Rating - Factor Rating H (High).
A high hazard rating was assigned because of the high toxicity of the fuel and solvents released at this site.

B. Persistence Multiplier for Point Rating.

Site No. 1 was assigned a persistence multiplier of 1.0 based upon the presence of metals in battery acid. Site No. 2 was assigned a persistence multiplier of 0.9, based on the presence of waste products such as fuel and solvents. These wastes correspond primarily to the HARM category of "Substituted and Other Ring Compounds."

C. Physical State Multiplier.

A physical state multiplier of 1.0 was applied to both sites because the substances released were liquids.

III. Pathways Category

A. Evidence of Contamination.

Site Nos. 1 and 2 were given a score of 0 (no evidence) because there was no noticeable vegetation stress or soil staining, and the potential sites are not greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination.

- Distance to Nearest Surface Water: Factor Rating 3.
  Site Nos. 1 and 2 are located within 500 feet of drainage ditches and storm sewers.

- Net Precipitation: Factor Rating 1.
  The average annual net precipitation at the Station is approximately minus 4 inches.

- Surface Erosion: Factor Rating 1.
  According to the United States Department of Agriculture, the surface erosion at the Station is slight.

- o <u>Surface Permeability</u>: Factor Rating 2.
  The surface permeability at Site Nos. 1 and 2 is in the range of 10^{-6} to 10^{-4} cm/sec. The soils are approximately 30 to 50 percent clay and the average permeability is 4.2×10^{-5} cm/sec.

- o <u>Rainfall Intensity Based on 1-year, 24-hour Rainfall</u>: Factor Rating 3.
  The rainfall intensity in the Station area is approximately 4.0 inches according to the <u>Climatic Atlas of the U.S</u>.

B-2 <u>Potential for Flooding.</u>

Factor Rating 0.
Site Nos. 1 and 2 are located beyond the 100-year flood plain of local streams.

B-3 <u>Potential for Groundwater Contamination.</u>

- o <u>Depth to Groundwater</u>: Factor Rating 3.
  The groundwater level at the Station fluctuates with weather changes. The average depth to groundwater at Site Nos. 1 and 2 is less than 10 feet.

- o <u>Net Precipitation</u>: Factor Rating 1.
  See B-1.

- o <u>Soil Permeability</u>: Factor Rating 1.
  The surface permeability at Site Nos. 1 and 2 is in the range of 10^{-6} to 10^{-4} cm/sec. The soils are approximately 30 to 50 percent clay and the average permeability is 4.2×10^{-5} cm/sec.

- o <u>Subsurface Flows</u>: Factor Rating 1.
  The bottoms of Site Nos. 1 and 2 are occasionally submerged.

- o <u>Direct Access to Groundwater</u>: Factor Rating 2.
  Direct access to groundwater through faults, fractures, faulty well casings, subsidence, etc., is a moderate risk for Site Nos. 1 and 2 because of the abandoned well at the Station. The condition of the well and the method of the abandonment are not known.

IV. Waste Management Practices Factor

A multiplier of 1.0 is applied to Site Nos. 1 and 2 because neither has any form of containment.